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14. BIOLOGY OF THE PALM KING *AMATHUSIA PHIDIPPUS*, AN EXTREMELY RARE AND ENDANGERED BUTTERFLY OF PENINSULAR INDIA

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Introduction

The Palm King *Amathusia phidippus* Linnaeus is an extremely rare and endangered species of butterfly that is strictly restricted to the southernmost tip of peninsular India, widely known as the Travancore in the State of Kerala (Wynter-Blyth 1957). Occurrence of several races of this species has been reported from Myanmar, Andamans, Java, Bali, Philippine Islands and Borneo (Abrera 1985). In India, Palm King has only been recorded from Travancore, near coconut groves. The species is reported to be locally common in areas where coconut groves are widespread and there appears to be no reason why they are rare at other areas of Kerala where there is substantially good availability of host plants along with comparable levels of temperature and humidity at similar altitudes (Wynter-Blyth 1957). Its rarity, patchy distribution and restricted habitat preferences makes it one of the few Oriental butterflies having a high conservation value (Conservation Value 33 out of 40; Kunte 2008). Recently, a small population of this butterfly was observed on ornamental palms in the Thenmala Ecotourism area in Kollam district, Kerala. The collected eggs in the field were reared on ornamental palms to study their biology. The information generated in this study is presented in this paper.

The collected eggs were reared on a potted ornamental palm *Dypsis lutescens* with sufficient foliage. The plant with the caterpillars was kept in a protected room with adequate aeration, sunlight and humidity to save them from predators and environmental hazards. The various stages were observed, photographed and length of different stages recorded.

Of the seven caterpillars that hatched out, two larvae were found to be dead and one was found missing. The remaining four caterpillars successfully matured, pupated and hatched to healthy adults which were later released in a garden containing several host plants, including the ornamental palm *Dypsis lutescens*.

Life cycle of Palm King

Eggs: The freshly laid eggs are creamy white with a small black spot in the centre and a black circular ring. The eggs are laid in a row. At Thenmala, we observed two rows, the first having 15 eggs and the second 3 eggs (Fig. 1a). Prior to hatching, the colour of the egg changes to black. Eggs hatch in 6 to 7 days.

Larvae: The first instar larvae are cylindrical, measuring 0.6 to 0.8 mm in length. The head is disproportionately large, round, black and shiny. The thoracic and abdominal segments are pale yellowish bearing slender, white hairs (Fig. 1b). The last segment has two black spines that look like tails with no additional hairs on them. The first moulting takes place on the fourth day.

The second instar larvae are pale greenish yellow measuring 0.8 to 1.2 mm in length. The head is black and globular with tiny slender white hairs. The hairs on the upper side of the thoracic segments are stouter than the rest of the body hairs, and are directed towards the head. There are two pairs of diffused whitish lines that run from the dorsum of the first thoracic segment to the last abdominal segment. Three black spots are present on the upper side of the third and fourth abdominal segments; the fifth, sixth and seventh segments have two black spots each. The eighth abdominal segment has a characteristic wide-belly bottle shaped black mark with its neck directed towards the ninth segment, which has an additional black spot (Fig. 1c). The last abdominal segment bears two black spines, which have many small hairs on them. As the larvae mature, the third thoracic segment develops a bright orange fold of skin which gives the caterpillar a peculiar striped appearance. After about five days of heavy eating and growth they undergo the second moulting.

The third instar larvae are morphologically very similar to the previous instar, but are longer (3 to 4 cm) and stouter. They are darker and more greenish than yellowish and had a striped appearance due to the wider body lines (Fig. 1d). The black spots increase in number and size giving a mottled

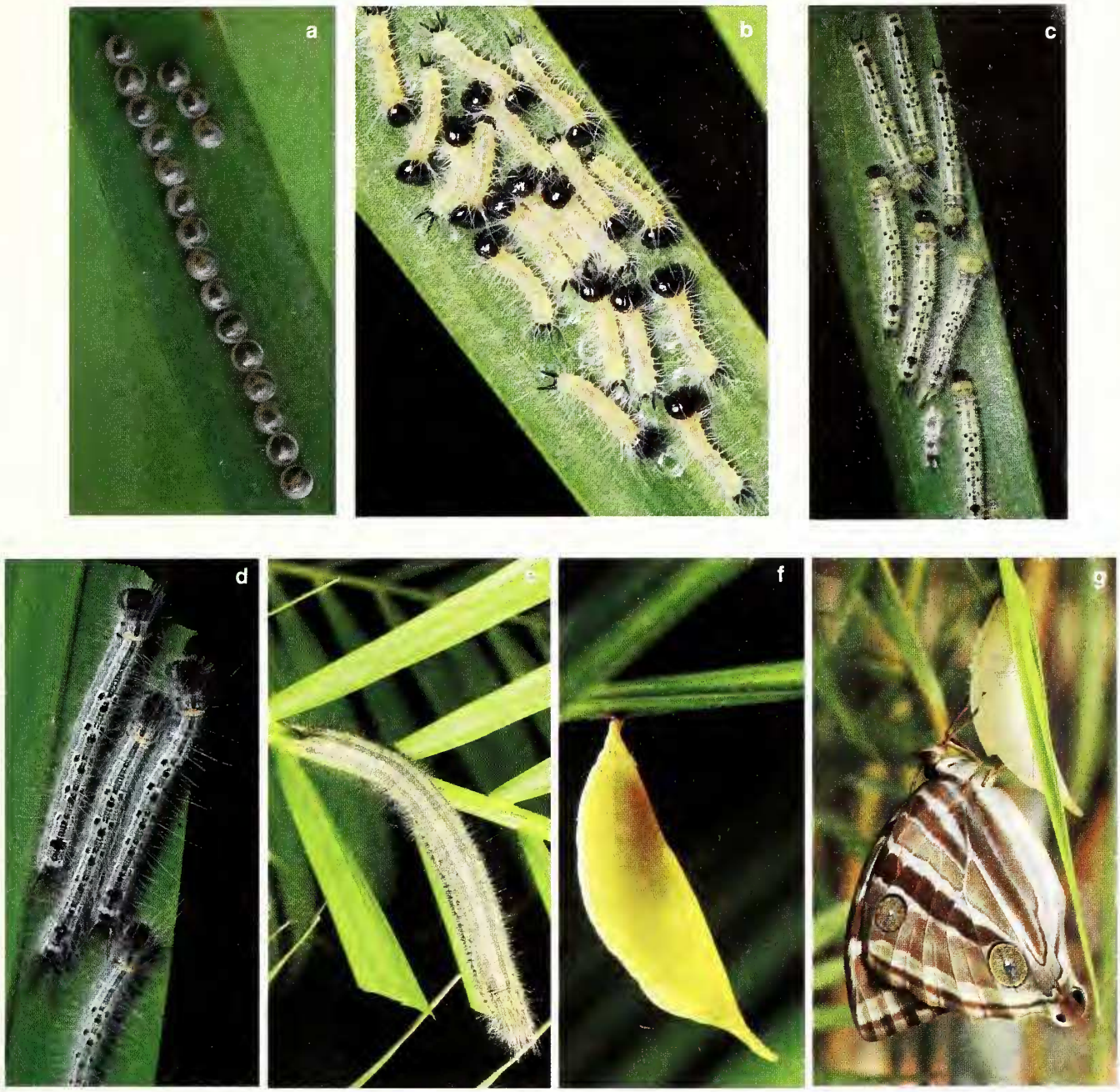

Fig. 1: *Amathusia phidippus*: a. Egg, b. First Instar, c. Second Instar, d. Third Instar, e. Fifth Instar, f. Pupa, g. Adult female

appearance. The hairs of the thoracic segments, which are pointed at the tip, grow stouter and longer almost hiding the greyish black head. The orange fold of skin over the third thoracic segment is also more prominent. The wide-belly bottle shaped black mark is more diffused and less prominent. The spines of the last segment grow paler. The larvae rested for moulting on the fifth day.

The fourth instar larvae are stouter and longer measuring 4.5 to 5.0 cm. They almost lose their colours and become nearly black and white. The stripes become greyish white or white. The orange strap on the third thoracic segment almost disappear with only the skin fold left with longer bright white hairs. The body appears more mottled with black. The bottle-shaped mark becomes nearly indistinct and diffuse with the background. The spines on the last segment are greyish white. The fourth moulting occurs on the sixth day.

During the fifth instar, the larvae become more brownish and measure 7.0 to 7.5 cm in length. They appear very stout and strong. The hair is white with a few scattered brown ones. The head has a new hand-like appendage with

four finger-like pointed branches (Fig. 1e). The thoracic hairs which project to the front nearly hide the head and appendages. The spines of the last segment are now of the same colour as the body. On the 12th and 13th day of the last instar, the larvae start to pupate.

Larvae of the Palm King are voracious feeders. Most of the time, they remain on the underside of the leaf, eating from the tip of the leaf working towards the base. The early instars prefer to remain in group and never stray away. But, as they mature, some moved away from the group, the behaviour being most marked in the last instar and peaked towards the days of pupation. The later instars prefer to remain on the upper side of the leaf as well.

With regard to coloration, the fifth instars show marked difference in their ground colour, some being more brownish and some more greyish. A link between the body colour and the future sex of the adult has to be established with more studies. A larger number of the caterpillars have to be observed to establish this link.

Pupa: The process of pupation takes about half a day. The greenish spindle-shaped pupa is well-camouflaged among the pointed leaves of the host plant (Fig. 1f). Initially, it is semi-transparent but later it becomes more opaque. The pupa has veins and lines similar to that of the leaves of the host plant, all veins ending at the pointed lower end of the pupa. The pupa becomes transparent on the eve of hatching, with the wings and head clearly visible. The hatching takes place on the 12th and 13th day of pupation.

Eclosion: All of the pupae hatched on two consecutive days between 0800 and 0900 hrs. The imago rested for about an hour and went on wings to rest in the shady bushes nearby.

Imago: ♂ ♀: Chocolate brown in colour having a wing span of 80-90 mm in specimens bred at Thenmala (Fig. 1g), although Wynter-Blyth (1957) states the wing span as 100-125 mm. Apex of forewing slightly conical; termen more or less straight; dorsum straight. Hind wing is with the dorsum expanded and flap-like, bare and pale brownish. Tornus produced into a slight conical lobe bearing two round black spots surrounded by a white ring dorsally and ventrally. Under side of both wings with a narrow marginal white band and a series of brown and white straight bands across. Two large eye spots at the apical and discal areas of the hind wing. Hind wing lobed at tornus. Velvety brown above. Upper forewing with diffuse yellowish band (which is prominent in female) just below apex and a narrow terminal yellowish band. Upper side of hindwing border-pale brown, bearing a dark marginal line.

Female: Abdomen with tufts on either side. Upperside of hind wing with fold and tuft and long erect hairs along base.

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15. ON THE COLLECTION OF THREE INTERESTING SPECIES OF *LEJEUNEA* LIB. FROM ABBOTT MOUNT, WESTERN HIMALAYA , INDIA

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Introduction

The genus *Lejeunea* Lib. (Hepaticae; Division Bryophyta) is represented by 21 species in India, of which, till recently, only seven species were known from the Western Himalaya, namely *L. bidentula* Herz., *L. cocoes* Mitt., *L. cavifolia* (Ehrn.) Lindenb., *L. nepalensis* Steph., *L. tuberculosa* Steph., *L. flava* (Swartz.) Nees and *L. wightii* Lindenb. (Mizutani 1964, 1971; Srivastava and Parihar 1986;